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THE PAPWORTH VILLAGE SETTLEMENT

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REPORT OF THE COMMITTEE OF MANAGEMENT AND CHIEF MEDICAL OFFICER FOR 1941

*Presented at the Twenty-fifth Annual General Meeting
of the Settlement, June 9th, 1942*

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Committee was strengthened by the accession of Mr. Edward Baron, Miss H. Chivers, Mr. W. Danbury, Mr. Macfarlane Grieve, Dr. G. Salt and Mr. Ian Winterbottom.

The thanks of the Committee are due to Mrs. H. R. Jenkins for very kindly presenting to the Settlement a portrait in oils, by Lance Calkin, of her brother, the late Sir Pendrill Varrier-Jones. This portrait now hangs in an honoured place in Papworth Hall.

During the year a plaque with the following inscription was placed in the vestibule of the Nelson-Langermann Hospital :

THE NELSON-LANGERMANN HOSPITAL

To help the sick that they may have
courage, endurance and hope.
In friendship to Florence Temple Cross
from F.E.L.

in these words the late Mr. F. E. Langermann desired that his gift should be recorded, and the Committee were pleased to act in accordance with the wishes of this generous benefactor.

The Committee wish to record the great loss sustained by the sudden death of the Rev. W. Shenton, to succeed whom the Committee has appointed the Rev. Pearce Higgins. In the interim Dr. J. D. Lineham very kindly carried on the work of visiting and he has now been appointed Free Church chaplain.

The Hospital Food Store and Cold Store, which had been in use since 1918, were rebuilt during the year, and a new refrigerating plant was installed.

The Committee decided on the recommendation of the Lady Superintendent to bring the salaries of the nursing staff into line with the recent scale approved by the College of Nursing.

An ambulance is an essential for an institution of such a diverse character as Papworth and through the kind efforts of Lady Rolleston a new ambulance given by the employees of the *New York Herald-Tribune* was received from the British American Ambulance Corps. This replaces our old ambulance originally put into service in 1914.

In connection with the care of Service patients, Papworth was visited by the Deputy Director of Medical Services and the Inspector of Medical Services, Eastern Command, and by Major-General Biggam, Consulting Physician to the Army.

A Works Canteen has been installed and has proved a great boon. The Committee has also established a Benevolent Fund for the Industries.

The Hospital Guild, under the kind direction of Mrs. Shore, continues to render most valuable aid to the care of the sick, and the Welfare Fund, administered by the Lady Superintendent, affords never-failing support to those in need. Without the help of Papworth's many well-

wishers, however, these two funds could not continue. The fact that they do continue, and that donations to our Appeal Fund continue to be received, show that despite the war, high taxes and reduced incomes, the principles for which Papworth stands are still able to evoke support.

In conclusion, the Committee wish to thank

all those who have supported them in their work during the past year: patrons, subscribers, and sympathisers, together with the medical, nursing and industrial staffs, who have thus enabled them to bring the ship of Papworth safely through an eventful year.

T. C. M. JOHNSON.

REPORT OF THE CHIEF MEDICAL OFFICER FOR THE YEAR 1941

While compiling an introduction to the various medical and departmental reports of the Settlement for the year, the following words caught my attention in *The Lancet*: "No sincere attempt has so far been made to enable the tuberculous patient to earn a satisfactory livelihood within the limits of his impaired strength."* The reference was to State action in the matter and not to the many whole-hearted attempts which have been made by private enterprise both in this country and abroad. The majority of such attempts have failed not for any want of sincerity, but rather because the various inescapable and fundamental principles underlying the problem have been ignored. We have seen in this past year some initiative taken by the State's social services, and it is to be hoped that a problem which Papworth has been tackling for the last quarter of a century will now be solved with equal success all over the country.

The late Sir Pendrill Varrier-Jones usually took a single facet from the mass of principles involved

in the Papworth organisation as a text for his preface to the Annual Report, and in looking over his reports, one cannot fail to see how very valuable these introductions are. I do not want to depart from this practice, and I propose this year to direct attention to the factor which is probably most ignored in any scheme for the employment of those disabled by tuberculosis. This is the fluctuating nature of the disease. At no time can one, with certainty, regard a patient's improvement in condition as a permanency, nor can a picture of the individual be made without reference to the vital factor of his or her personality and outlook in the future. In this connection it is interesting to quote the words of Sir Arthur MacNalty, lately Chief Medical Officer to the Ministry of Health, who wrote ten years ago: "Tuberculosis is a protean disease; its manifestations have to be studied in the individual patient and that study must be based upon clinical experience. The treatment given must be adapted to the present needs of the individual patient; a rule of thumb treatment which

**Lancet*, 1942, Vol. 1, p. 412, April 4th.

automatically puts patients with early physical signs into sanatoria and others into hospitals, meets with inevitable failure.”*

It is, as it were, as an answer to this fluctuating condition that Papworth has developed its treatment system in the way which is familiar to so many to-day. Not only has it fully equipped hospitals but also, side by side, sanatorium units and hostel units, and all these, with various annexes, cottages and workshops, form the one administrative whole—the Village Settlement.

“The average consumptive leaves the sanatorium in a state which is little better than an equilibrium between attack and defence. The patient who just holds his own while putting no strain on his resources relapses directly he is compelled to draw upon them. *The credit in the account of the consumptive is always very small.*” (the italics are mine).

This extract from the leading article in *The Lancet* of January 7th, 1939, reveals better than any words of mine what I mean by the fluctuating nature of the disease. Papworth’s organisation is designed specifically to make secure, gilt-edged, if possible, that fragile credit in the individual’s account.

It is interesting to compare Papworth 10 years ago with Papworth to-day. The only difference in the scheme when Sir Arthur MacNalty wrote the words quoted above and now, is its growth.

We have gained, of course, an enormous amount of practical experience ; but neither in

this period or earlier has our work brought to light any sudden new fundamental principle other than those which we learned and which were taught us by our Founder. The soundness of his teaching is reflected in Papworth’s success, and now this has become, like the Institution, a national heritage.

It is a remarkable fact that not a penny spent on the expansion of Papworth has been spent on something which to-day is useless. Every building erected, every piece of apparatus and machine is to-day treasured and cherished as a vital part of the organism which is taking full part in the war-time anti-tuberculosis services.

Ten years ago the report opened with sorrow. The death was recorded of Sir Frederick Milner, one of the greatest of Papworth’s friends and protagonists. This year we must record that of one who can never be replaced, our greatest friend. our Founder.

In 1931, in such sorrow and amid such loss, we wondered how we should progress without Sir Frederick Milner. Now this year we wonder even more : but surely we can take encouragement from the progress which has been made from that year of sorrow to this ? Ten years ago the Hospital system boasted a total of 368 beds ; now it is 520. Papworth has become the largest tuberculosis treatment unit in the British Empire. What of the next ten years ?

*Ministry of Health: Reports on Public Health and Medical Subjects. No. 64, p. 75. 1932.

In 1931 our report commented upon the Act of Parliament "which brought public assistance within the province of the Local Authorities, at once threw into bold relief the two aspects of tuberculosis with which Papworth deals—the medical aspect and the economic aspect." In that year we introduced a sliding scale of fees which, it was noted, "has already found favour with general progressive authorities who now find it cheaper to send cases to Papworth than to retain them in their own sanatoria." Ten years later, to-day, our waiting list, although too long is proof that our facilities are still a sound proposition to the Local Authorities.

To recall some words of the 1931 Report again—"it is far cheaper to secure settlement for larger numbers of tuberculous persons and their families than to continue the practice of sending them prematurely back to their homes." These words echo still, and in the last 10 years over thirty cottages have been added by private subscriptions to the Papworth Estate. The vitality of the scheme cannot be better demonstrated than by the fact that to-day over thirty three men are awaiting cottages still.

It always pleases me when I find men or women sent to us from Service units, manifesting every wish to stay at Papworth and to have every prospect of becoming good permanent employees, being allowed by their responsible Local Authority to remain for treatment in our own hospital system in preference to their

return to a bed in the local sanatorium. This has happened several times this year, especially with young men from the Services who have never yet known the devastating consequences of being diagnosed tuberculous. To such a person awaiting a Medical Board, the extent of the blow which follows when they realise the consequences of the diagnosis, is hard to realise. To quote Sir Pendrill in his report for 1939 :

"This war will not only witness the destruction of tissue by disease, it is inevitable that the strands of moral fibre attuned to civilian life will be frayed and slackened by the clash of war and subsequent disablement. No cash bonus alone will attune the character to civilian pursuits. The gradual return of a tuberculous man or woman to work after prolonged treatment is as much a test of moral determination as of physiological efficiency."

Now to revert again to the last ten years: In 1931 our capacity for offering permanent jobs was confined to a turnover which was less than *one-sixth* of what it is now, and by floor space which was barely an eighth ! Can there be any greater pace of growth ?

Having lost now our Founder, shall we be able to look forward, as he looked forward when he lost, ten years ago, his greatest friend, Sir F. Milner ? From the midst of the greatest economic slump to the midst of the greatest war, Papworth has been able wellnigh to dupli-

cate its hospital system and quadruple its employment capacity.

If this can be done, what will the challenge of *The Lancet* provoke ? As long as Papworth's principles are on the same sound foundation, and as long as there is a real need, surely Papworth must grow !

Ten years ago, our Report contained a selection of Sir Pendrill's obiter dicta, selected by himself. These are now reproduced as a refreshment for those in our midst and for fresh guidance and stimulus for those afar off in the same field of work facing the same difficulties.

OBITER DICTA, 1931-1940.

1932. "The success or otherwise of the sub-standard community depends upon the balance which is struck between the struggle for existence and the forces that produce that struggle."

"The middle case which is the case par excellence with which the village settlement deals is unsuitable for the sanatorium which presupposes the existence of the early curable case. Yet two-thirds of the beds of sanatoria are filled with these incurable cases. Why, then, does this anomaly exist ? Surely because we are afraid to tackle the problem at its roots."

"If the community accepts as a matter of course a way of life which leads to health . . . a mental adjustment is needed, and it is the striving for this mental adjustment which is the corner stone of our work. I would stress this point to the uttermost ; it is one of the secrets for the solving of the tuberculosis problem."

1933. "The degree of ability to respond to effort is the sole criterion of the extent of disease, whether the disease be tuberculosis or not."

"To-day we are in great danger of confusing the treatment of the individual with the treatment of disease. We strain at a gnat and swallow a camel. A patient who is unfitted for his environment must be treated for the whole of his unbalancing process, his want of harmony with his surroundings, his lack of ease, that is his dis-ease."

"A patient is a complex ; that complex requires treatment ; that treatment is built up on study. But study is not treatment—let us remember that.".....

1934. "It was our aim to become, eventually the sympathetic employer on a large scale."

“ It is useless to make a policy of training patients in craftsmanship. It is worse than useless : it is wasteful.”

“ All subsequent experience has shown beyond question that without up-to-date workshops the employment of the disabled on anything like a self-supporting basis is an impossibility.”

1935. “ What is, or should be, the aim of all treatment ? Let our aim be to restore wage earning capacity as fully and as quickly as possible, so that the vital psychological factor, whose chemical effects we hardly understand and repeatedly under-estimate, may work with us and not against us.”

1936. “ No amount of energy could build up a community such as Papworth unless something was embodied in it which was real and substantial and which fulfilled a dire need.”

“ Of what use is it to re-educate the consumptive if the chances of employment are so few ? Before we attempt to re-educate him, he must know, and know surely, that there is work and security awaiting him.”

1938. “ The special arrangement made years ago with the Friendly and Approved Societies and the new arrangement made in 1938 with the Trades Unions constitute, in my view, two of the most important milestones on our road. It leads, in my submission, to a revolution in the national outlook on the whole subject of disablement.”

THE SURGICAL UNIT

The Nelson-Langermann Hospital.

During 1941, 25 operations were performed in the Surgical Unit. These were :

Thoracoplasties	10 (one was in two stages)
Phrenic Nerve	9
Rib resection	1
Combined operation	1
Thoracoscopy	3

Of the thoracoplasty patients three are now free from symptoms and working 4½-6 hours in Papworth Industries ; one left the institution at an early stage in convalescence and his present condition is not known ; and one developed an acute spread of the disease very shortly after the operation and the ultimate prognosis is bad. The remaining five* are convalescing and there is every hope that they will be able to return to

*Two have subsequently had a second stage operation and are doing well.

work at Papworth. The phrenic nerve operations were, with one exception, crushes rather than avulsion with a view to subsequent major operation if necessary.

An attempt is now being made to follow up all thoracoplasties done since the inception of the Surgical Unit in 1936.

We are much indebted to Mr. J. B. Hunter for his ever helpful advice and operative skill, and to Dr. Webber who has given all the general anaesthetics.

THE OUT-PATIENT DEPT.

Morning visits	...	...	...	6287
Evening	...	...	...	4139
Casualties and new cases	...	...	...	1948
Routine B.S.R.'s	...	...	...	3217

This department deals with casualties and minor ailments amongst the patients and the village population, and also controls the clinics devoted to ante-natal and child welfare, physio-therapy, collapse therapy and refractions.

We were glad to welcome back Mr. Weeden Butler, who paid frequent visits during the year to advise on the treatment of our orthopaedic cases, and he was especially helpful in arranging for the specialised treatment of our Service cases. Miss Willis, in charge of our physio-therapy clinic collaborated with Mr. Butler, and gave the following treatments :—

Heat treatments	...	...	...	26
Ultra-violet ray	...	...	...	37
Massage	...	...	...	47
Faradism	...	...	...	21

In all, 106 patients were seen in 1703 attendances.

We are grateful to Mr. Hamblen Thomas, and later, to Mr. Walford, for their kindness in seeing our patients at their Out-patients Depts. at Addenbrookes, and also to Dr. Canney for his helpful advice in our gynaecological and obstetric cases.

In the collapse therapy clinic, 66 artificial pneumothorax inductions were made, and 1900 refills given during the year, by our Medical Officers.

Dr. Watson attended frequently and saw 101 patients in all requiring ophthalmic treatment under the National Ophthalmic Treatment Board scheme.

THE VILLAGE

The health of the village as a whole has remained good during the year : in fact, despite rationing and the absence of many articles of diet considered so necessary in the years of peace, one might say that is it better. Measles in a mild form was the only epidemic to affect the children in the early months of the year.

Six children were born during the year under review, all healthy and remaining in good health. All children of school age and those from 3 to 5

years were X-rayed during the summer holidays, the results confirming the absence of any signs of active tuberculosis.

DENTAL CLINIC

Mr. W. Baird Grandison.

No. of Sessions	...	...	...	56
No. of Attendances	...	...	...	962
No. of Fillings	...	...	...	336
No. of Extractions	...	...	...	746
No. of Scalings	...	...	...	91
No. of Teeth Treated with Nitrate of Silver	...	...	...	128
No. of Cauterisations	...	...	...	48
No. of Dentures Supplied	...	...	...	80
No. of Dentures Repaired	...	...	...	46
No. of Other Operations	...	...	...	201

A casual study of the above figures indicates that the quantity of the dental work performed is quite up to the usual level. Fillings are still considerably less than extractions in numbers, and although this is deplorable, to some extent it is nevertheless inevitable considering that patients attending the dental department are not only of all ages, but many are suffering from a deficiency disease, and in such cases the teeth must necessarily suffer, at least in the present state of our knowledge.

Cauterisation has been found to be a most useful method of dealing with cases of acute

gingivitis, especially after a careful scaling has been carried out.

DEPARTMENT OF RADIOLOGY.

Mr. E. W. Groves.

Bernhard Baron Hospital.

X-ray Photographs	...	...	2759
„ Screen Examinations	...	...	3650
Reduced prints and lantern slides of X-ray photographs	...	...	523
Included in the total of X-ray photographs taken were :—			
360 for Hunts. C.C. and local practitioners ;			
162 of Hospital Special and General Staff ;			
141 of children of the Settlement of school age, including 13 evacuees ;			
621 of Papworth Industries personnel.			

Vaughan X-ray Department,

Nelson-Langermann Hospital.

X-ray photographs	...	...	274
„ Screen Examinations	...	...	494

The general increase in war-time activity of the Settlement is reflected in the above statistics of the two X-ray Departments, particularly in the number of photographs taken at the Bernhard Baron Hospital, which outnumber those taken in 1940 by just over 900.

It is satisfactory to note that the Settlement can be of service to its neighbours in that no

fewer than 360 films were taken of out-patients referred for examination by various local authorities and individual practitioners. Of special interest is the fact that in the case of a small percentage of these an examination was requested by Medical Boards who had examined patients under the National Service Act.

The obvious comment is that the necessity is urgent for the setting up of mass radiography clinics, where not only potential service personnel, but also the whole of the population may be examined periodically.

In this connection it is worth while recording the heavy volume of work allocated to this Department by the Settlement's policy of vigilant surveillance of all non-tuberculous personnel engaged for service, however temporary, in every section and department. Not only does every applicant have an initial film taken of the chest, together with a medical examination, but a continuous follow-up is maintained, resulting in a series of new films in a number of selected cases.

Our survey material in this connection is of the utmost value, and research into many interesting points is thus made possible.

During the year the scope of the B.B.H. Dept. was increased by the purchase of a 3/6 KW Protexray Goliath Tube, the finer focus of which has given a most satisfactory improvement in the quality of films taken for orthopaedic purposes. At the same time new intensifying

screens, including a pair of "Fluorazure," were acquired, and it is noteworthy that with the addition of a new rectifying valve in 1940 the above are the only major items of capital expenditure incurred since the installation of the plant in 1933, since when over 13,000 radiographs have been taken, and more than 18,000 screen examinations made.

REPORT OF THE RESEARCH DEPT. BIOCHEMISTRY: D. Barron Cruickshank.

Zinc Levels in Normal Population. During the past five years there have been published by scientists some 200 papers on the physiology and biochemistry of zinc in plants, animals and man. The three most important are probably that: 1. The zinc of red blood corpuscles is associated with the anhydrase enzyme system (Kalin & Mann); 2. Zinc levels are lowered in Beri-beri (Eggleton); the relation of zinc to pituitary function (Elvehjem & Hart). There thus remains no doubt as to the essential function of this element in metabolic processes. The fact that zinc levels are raised in tuberculosis has been demonstrated in this laboratory and pursuant of this work—with special reference to possible resistance factors towards infection—the distribution of zinc levels in a normal population is under examination.

Zinc in Cancer. Observations on raised zinc levels in cancer tissue have been made by several

workers. Because of certain statistical relationships of cancer and tuberculosis (Research Bulletin, 1939) suggesting some association of the two diseases it becomes interesting to determine to what extent the type of variation in zinc content of the dental tissues already noted in tuberculosis, also occurs in cancer. By courtesy of Prof. Kennaway a collection of specimens suitable for analysis is being made by the Dental Unit of the Royal Cancer Hospital.

Zinc Analytical Technique. For these and other experiments it has been necessary to evolve a method of estimating .02 mg. zinc with an accuracy of a few per cent., this being specially needed for the "normal population" survey. In the process of developing the technique observations have been made on the formation of highly complex zinc salts during the reactions and while the problems here involved are largely of chemical interest the methods of controlling formation of these complex salts is an essential step towards obtaining the requisite accuracy for the method; estimation of one five-millionth of a gram is required.

Other Zinc Studies. Calcification : The high concentration of zinc in bone and allied tissues suggests some connection with calcification phenomena. The raised content in tuberculosis may be evidence of a similar effect. Hence the method of analysis of hard tissues is being orientated so that additional information on this function can be obtained. Some evidence

of zinc's relationship to phosphatase enzyme (calcifying enzyme) already exists and two lines of experiment have been planned to investigate more fully this aspect.

Bacteria : The concept of the zinc diathesis in man can be extended to other living forms. Of primary interest is the zinc function in micro-organisms, particularly in the acid-fast groups. For such investigations mass cultures are required and suitable strains are under culture. The main object is to determine whether tubercle and/or other acid-fast strains have any unique characteristics in relation, in the first instance, to zinc content.

Capillary Manometer. Experiments with an apparatus mentioned in the last report have been started, but progress is not yet sufficient to assess its utility in the type of problem for which it was designed.

Vitamin C and Dental Caries. A paper containing the results of an investigation carried out in the Settlement over a period of two years (in collaboration with Dr. Stott and Mr. Grandison) has been compiled. The result of this investigation, which shows that a daily ration of synthetic vitamin has no effect on the progress of caries in already calcified teeth, is interesting, as an American experiment in which 16 oz. of orange juice per diem was used to supplement the diet showed distinct arrest of caries. One concludes therefore, that some factor in the juice other

than Vitamin C is the active substance ; previously it was presumed that the vitamin was the most likely factor to effect this arrest.

Regional Distribution of Disease. The late Raymond Pearl, a prominent American statistician, has recently remarked "Experience indicates that mapping, intelligently used, may become an important adjunct to other statistical methods in public health and medical work." Work in our laboratory has revolved round this fact with the aim to establish some new and necessary criteria for interpretation. The first section of this work is in Research Bulletin, 1940. Many existing published maps have been analysed (mainly cancer of various organs) and the method will be applied also to maps of tuberculosis distributions.

Theory of Cancer Phage. The object of this work has been to determine, by an examination of all the available statistical record, to what extent these detailed figures supported or did not support the concept of the bacillus tuberculosis as a vector of a carcinogenic phage, an idea originally promulgated from very meagre data, has been accomplished. These additional tests, as far as they are capable of application, show agreement with the earlier hypothesis and thereby place it on a more secure foundation. The main advance is that by virtue of the finer detail available from the analysis of $3\frac{1}{2}$ million deaths (cancer and tuberculosis) covered by the study,

the internal structure of the hypothesis has become sufficiently consistent to permit visualization of the type of work needed for experimental test. The basis of such tests would be an extensive experimental investigation of certain calcified lesions by means of the electron microscope and while this is impossible at present some tentative approaches are under way. Dr. Preston, of the National Physics Laboratory, has kindly given permission for the taking of a few photographs with their electron microscope.

Routine Work. This continues to occupy an increasing proportion of the time of the staff and the general nature of the work is summarised in the tables.

Industrial Work. The laboratory always welcomes an opportunity of assisting the Industries in any specific problem lying within its sphere. This opportunity arose on several occasions, 23 reports being issued. Routine control of the water softening plant and routine testing of milk supply are regularly carried out. Emergency chlorination of water supply has also been arranged.

Routine Chemical Examinations.

Medical.

Urine	1680
Quantitative Sugar	342
Histidine	43
Blood Sugar	22

Blood Urea	7
Urea Clearance	8
Test Meals	3
Various other	25
Industries.	
Wood	4
Sludge	7
Electrolytic Softening Tests.....	26
Boiler water, CO ₂ , etc.,.....	250
Other	6
General.	
Milk (Fat and Total Solids	3
Milk (Phosphatase tests)	198
Water Analysis	11
Water Hardness (tap samples)	301
" " (plant efficiency)...	88
Water, Chlorination Tests	32
Zinc Estimations and Controls.....	704
Routine Bacteriology, etc.	
Sputa	2416
(plus 37 Huntingdon)	
Sputum Specimens Cultured	176
Other Routine Cultures	1324
Kahn	23
Meinicke (Syph.)	23
Blood Counts	159
Haemoglobin	169
Animal Inoculations	34
Milk and Water	5
Micro-Manometer Readings	2166
" " Experiments	138

PATHOLOGY : Dr. E. Brieger.

Post Mortem Analysis

Among the autopsies carried out this year there have been a larger proportion of cases of the malignant type of young adult tuberculosis than in former years. A few cases of probable interest to others are these :—

- A. The appendix had been removed two years previously. Abdominal symptoms developed and ultimately death was caused by peritonitis. At the post mortem the wall of the caecum contained a large number of caseous abscesses penetrating into the muscular wall of the abdomen. In the mesentery of the caecum were a number of calcified and caseated glands, one of which was broken down and contained masses of tubercle bacilli. There must have been repeated miliary spreads from this lesion, as the lung was studded with miliary tubercles.
- B. A tuberculous lesion of the ankle was the first symptom, followed two years later by an abdominal complaint which was diagnosed as Salpingitis. At this time a cavity was present in the right lower lobe, and the condition subsequently deteriorated. At the post mortem the appendix was found to be tuberculous ; the lungs contained a number of foci which were partly calcified

and partly caseous, suggestive of a previous air-born infection. Tubercle bacilli were demonstrated in all these foci. The tracheo-bronchial glands were not seriously affected. There was a spread of miliary tubercles in the lung, and death resulted from meningitis of a diffuse exudative type, with many tubercle bacilli in the fluid.

- C. developed a Broncho-pneumonia of the left lower lobe, which was first considered to be non-tuberculous. There was, however, a fibrotic focus in the upper part of the left lung and another in the right middle zone. The disease took a very rapid and fatal course, and a tuberculous cavity developed in the left lung, and subsequently in the right. At the post mortem the left upper lobe was found to be transformed into a large abscess filled with a thin purulent-caseous material. Besides this lesion, old, dry caseous foci were present in both lungs, and it is probable that the acute infection of the lungs developed from a sudden liquefaction of the old caseous focus of the left upper lobe.

In all these cases, therefore, the acute and fatal course was preceded by a stage of *latency*, during which tuberculous lesions were present to some extent without causing clinical symptoms. They were "endogenous" exacerbations, developments of lesions which had resulted from an earlier infection, the exact

date of which, however, it would be difficult to assess.

In these types of cases we are trying to reconstruct the course of events, not aiming at "stage-typing," but if possible at "age-typing" (as mentioned in my report for 1940) and at establishing the patho-genetical relationship between the various lesions.

Experimental Pathology and Bacteriology

Research into the problem of the "Lag-phase" of the tubercle bacillus led to some interesting facts suggestive of distinct reproduction phases in its development. It is a well-known clinical fact that after inoculation a certain time elapses before lesions appear at the site of inoculation. We have studied the process which takes place during this interval between inoculation and manifestation. We were at first able to show, by recording the oxygen intake of growing cultures, that three phases can be distinguished in the development of a growing colony: a period of two or three days when oxygen consumption is practically negligible: a sudden rapid rise in the oxygen intake from the 3rd to 10th day, and then from the 10th to the 12th day onwards an almost complete cessation of oxygen intake. This cessation, however, is not due to oxygen starvation or exhaustion of the medium, nor to

a diminution in the vitality of the bacillus, as after the original growth is scraped off the same life cycle is revived in the original test-tube, as well as in the sub-culture. Moreover, it could be shown that during the time the growing culture ceases to take in oxygen, it absorbs CO₂.

Encouraged by these observations, we have studied these various phases in the development of the bacillus by growing it on slides and on the allantois of the chicken embryo. The results of these investigations will be published separately, but this much can be said, that there is definite proof that the tubercle bacillus, when sub-cultured on an artificial medium has to regain its vitality by passing through a series of reproductive phases in which the virus changes into a different form. The implications of these findings are still under examination.

Some practical applications of the measurement of the respiratory exchanges of living cultures of tubercle bacilli are being studied ; the retarding effect of sera and exudates on the growth of the tubercle bacillus : the action of chemotherapeutical agents by applying a spray of a chemical solution to the culture at about the fifth day when the oxygen intake has reached its maximum. This method further allows for the study of the vitality of the bacillus in sputa taken from various cases of tuberculosis, and might throw some light on the virulence of bacilli isolated from different cases. Slide culture has proved to be a valuable aid in studying the early

stages of bacterial growth ; the bacilli are grown in a drop of liquid medium, and surface smears are made at fixed intervals.

Although interesting results have been obtained in the study of the early phases of bacterial growth by using the allantois membrane of the chicken embryo as a culture medium, the practical application of this method for the early diagnosis of bacilli in sputum has proved to be limited.

Industrial Physiology Laboratory

The value of this, the latest addition to our manifold research activities, continues to prove itself, and this year has been marked by the removal of all the apparatus into a building which has been specially adapted for the purpose. The nature of the work is, in the main, assuming the character of routine testing and tabulating, but, as always, a volume of routine work throws up points of extreme interest, many of which show new vistas for research. The previous reports show the detail upon which the work is based, and the Research Bulletin records the results of investigations completed from time to time.

INDUSTRIAL REPORT.

Mr. B. Tallyn, *General Manager.*

From the beginning we have been influenced by a recognition of the fundamental economical

laws governing everyday life ; the chief being the family unit and the right, nay, the absolute necessity, of the breadwinner to a living wage. Even though he may be disabled, disablement, in whatever form, should surely not mean being deprived of the right to work. It was soon apparent to us that modern and efficient machinery can to a large extent offset the disadvantages under which the disabled labour. We therefore set ourselves to provide this machinery as far as we were able with the limited means at our disposal.

Certain extensions have been made, not the least being the addition of four more kilns for accurate moisture control of timber of all kinds, both hard and soft woods. This is a very intricate operation, calling for the highest technique and care. Valuable consignments of timber most difficult to replace could very easily be ruined, yet the intricacies have been mastered by a disabled man to such a high degree of perfection that the most valuable of woods for the manufacture of essential components are now entrusted to his care.

The activities of the Industries are confined to Wood, Leather, Fabric and Print. Housed in five well-lit, well-ventilated factories, heated from a central power house, with good distances between each, the general plan has proved to be a good one, eliminating as it does, the possibility of a complete breakdown through enemy action. This might very easily happen, were all our

activities housed under one roof. Despite the difficulties and volume of trading in wartime, post-war problems are being kept in mind.

In pre-war days the Industries created a sound good-will. Our products, under the Trade Mark "Pendragon," had already found favour in a good many walks of life. The policy of maintaining a very high standard of production was not without satisfactory results. The difficulties of trading with quota restrictions and of obtaining the necessary raw materials have undoubtedly affected this "good-will," but strenuous efforts have been made to hold the framework together so that our name and the familiar figure of our Trade Mark are kept before the eyes of our purchasing public, whom we like to look upon as our friends.

In pursuance of the Government's request to encourage the export of manufactured products, representation was secured in the official investigation of South American markets under the leadership of the late Marquess of Willingdon. A Stand was taken at the Canadian National Exhibition held in Toronto and agents appointed for South Africa and Australia. Naturally, such efforts do not bring immediate results, although at the time of writing (early March) it is pleasing to note that several shipments have already been sent, and orders, in very encouraging quantities, are coming in consistently.

Quite a noteworthy feature to place on record has been the remarkable ability with which our

workpeople have adapted themselves to new conditions. We have certainly not been alone, in suddenly finding certain commodities without a market.

Business in wartime is exceedingly trying and difficult ; how futile, therefore, do mere words seem in these circumstances to express admiration and thanks to our Staff and Workers for the magnificent way in which they have met the situation.

In conclusion—it is perhaps a major triumph that the impact of war upon our organisation has not resulted in any single member of our disabled personnel being disemployed. Not only is this proof of adaptability, but proves conclusively the value of the emergency measures to meet the situation which the management undertook early in 1939.

THE SOCIAL LIFE.

The social life of the Settlement has continued to flourish during 1941, and in so doing has given proof of a healthy community spirit—if a capacity for unselfish labour, a strong desire for knowledge, and a willingness to co-operate can be so termed.

First and foremost, the various forms of Civil Defence have remained well manned and the members thereof keen on their duties. The only occasion on which they were called upon to

take part in an actual incident showed them to be eager, efficient and resourceful. The exercises which took place later in the year proved them to be as keen as ever, despite the long lull in enemy activity. Representatives of the Civil Defence organisations, the Home Guard, etc., have formed a Parish Invasion Committee, and have taken steps to safeguard all the many aspects involved in the protection of the Settlement.

The Horticultural Society concentrated its activities upon encouraging food production, and organised two small Shows, one in June for roses and cut flowers, and one in September for vegetables, in both of which the standard of horticulture in Papworth was proved to be high. We were glad to be able to provide some ground behind the Princess Hospital for patients' allotments and several prizes were awarded in the open classes for vegetables produced on these plots.

The Editors this year presented the 20th edition of the Papworth Annual which, although greatly reduced in size, has a wider appeal than ever, and we think, reflects great credit on all concerned in its production.

The annual pantomime this year, "Jack and the Beanstalk," was performed to appreciative audiences of 400-500 by the Papworth Players, a company of 50 being assembled together for this noteworthy communal effort.

We have to thank the following organisations for their efforts to bring entertainment to us, efforts which were highly appreciated by the varied sections of our community, for as will be seen from the list, there is something for all tastes :

Nursing Association : Comforts Fund Social evenings.

Workers' Educational Association : Celebrity Concerts, two film shows and courses of lectures on Music, Biology and the Drama.

Mr. Cornell, Histon : Punch and Judy for the children's Christmas party.

C.E.M.A. : The Market Theatre.

Miss Joan Metcalfe : Concert Party.

The People's Theatre.

The R.A.F. " Slipstream " Concert Party.

Cambridge A.O. Society : Carol Concert.

We must add a special word of thanks to the Nursing Association for the social evenings successfully organised in aid of our Comforts Fund for the local boys and girls now serving. The Association has done particularly good work in providing parcels for prisoners of war and for members of the staff on active service.

Towards the end of the year we were fortunate in securing the interest and help of ENSA, and to them we are indebted for a series of excellent concerts for our Service patients.

Her Majesty Queen Mary graciously sent a large box of games and calendars for the patients and nurses at Christmas, and that Papworth still holds high place in the memories of many was evidenced by the large number of other Christmas gifts for the patients from many ex-patients and friends.

Early in the year Papworth had its War Weapons Week, well organised by a committee of its citizens. The target was £1,500, and the amount realised was £4,500—a fitting comment on the soundness of the social life at Papworth.

In conclusion, I cannot, after my first year of office, close this report without paying a tribute to our wonderful Matron, Miss Borne, who in this year of sadness, triumphing over all things, has kept alive that unique happy family spirit which still permeates as strongly as ever our present vast dimensions. To our Honorary Staff, particularly Mr. J. B. Hunter, who has now joined the Committee of Management ; to the Committee itself ; to my assistant medical officers ; to the Assistant Matrons, indeed to the whole staff of the Settlement,—Sisters, Nurses, and industrial management, and to our never-failing and most able Secretary, Mr. T. C. M. Johnson—my very sincerest thanks are due.

Papworth is a team, and together we go forward.

D. MacCALLUM.

